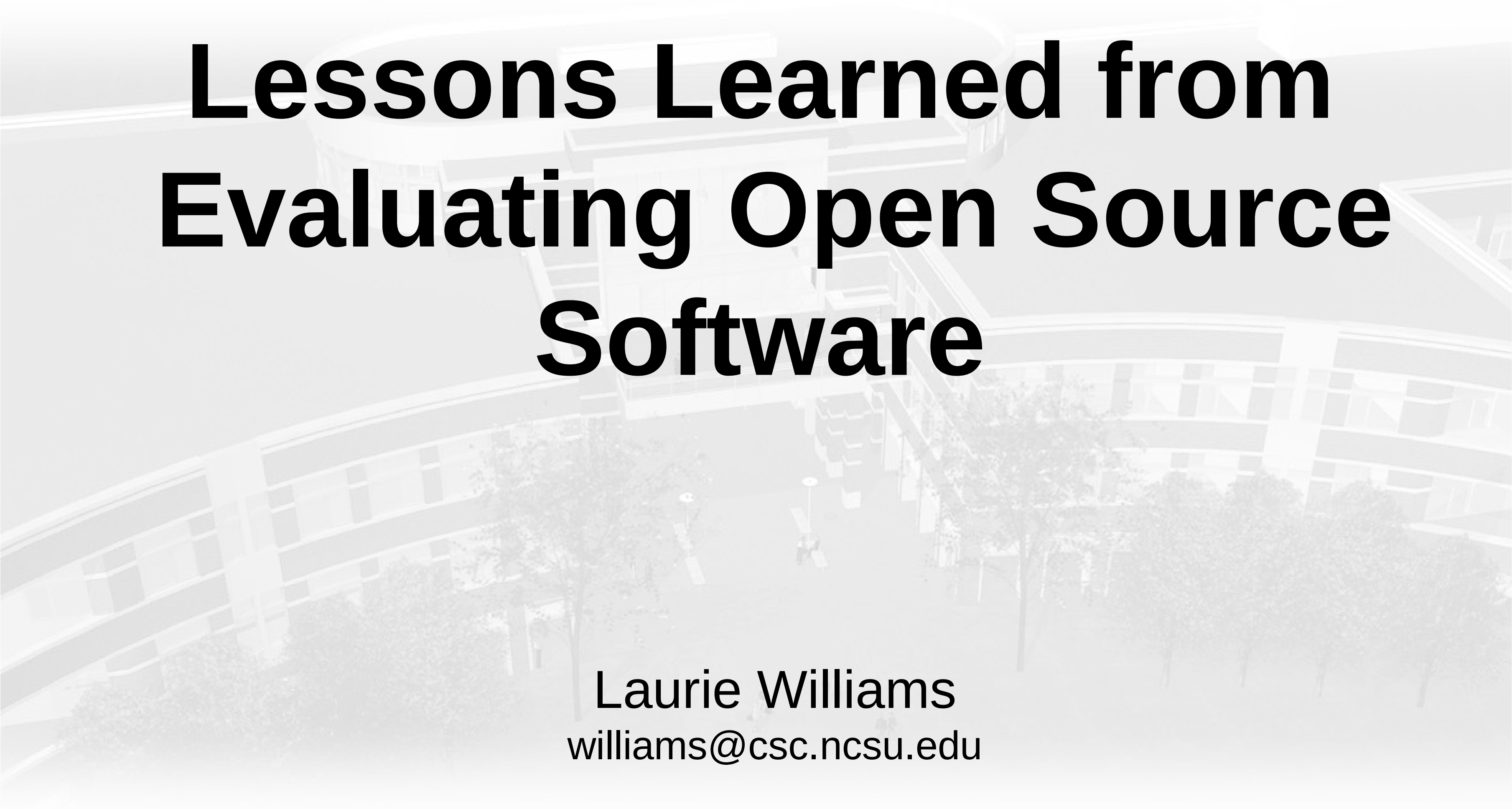

# Lessons Learned from Evaluating Open Source Software

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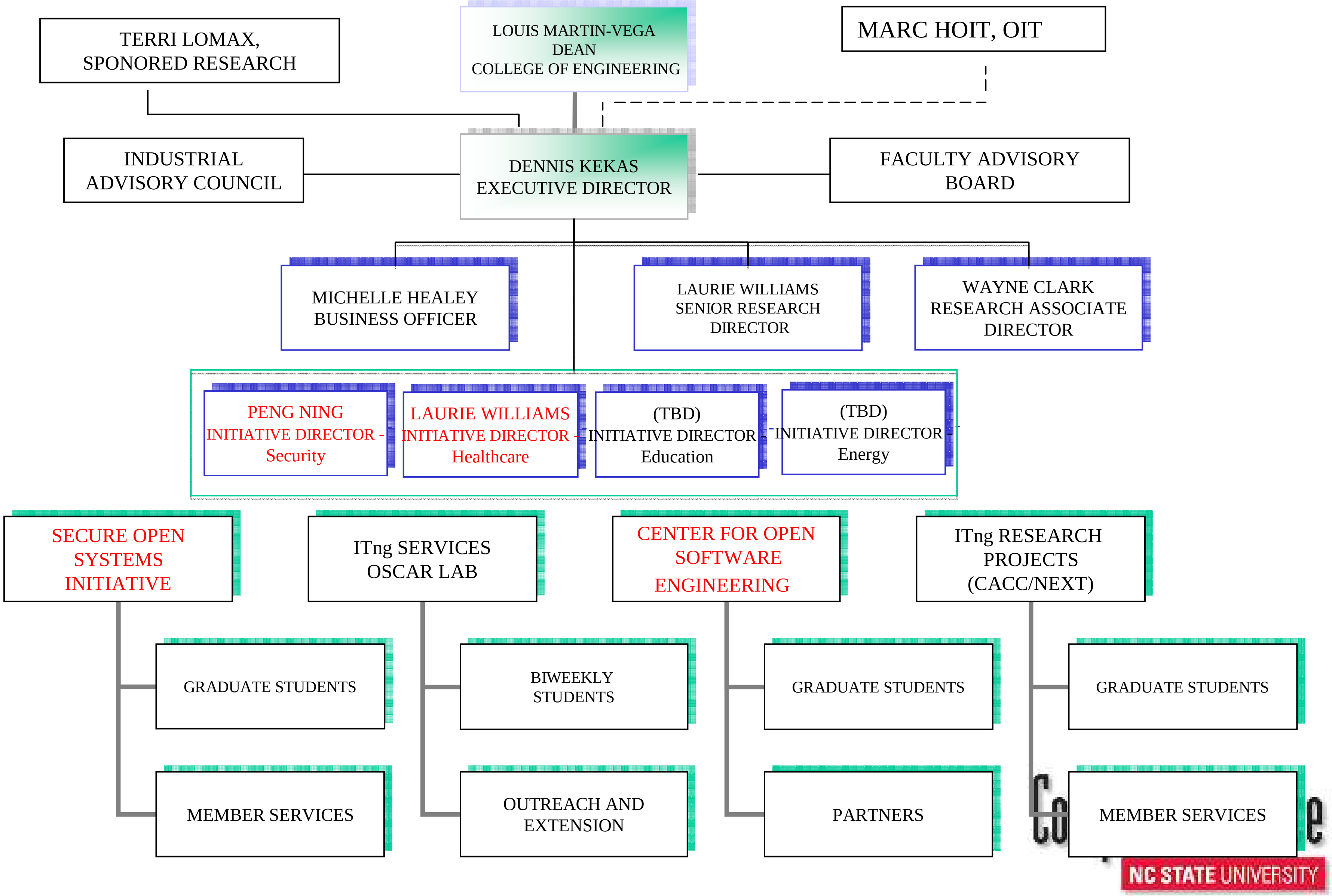
# INSTITUTE for NEXT GENERATION IT SYSTEMS



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SYSTEMS
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SOFTWARE
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ITng RESEARCH
PROJECTS
(CACC/NEXT)

GRADUATE STUDENTS

MEMBER SERVICES

BIWEEKLY
STUDENTS

OUTREACH AND
EXTENSION

GRADUATE STUDENTS

PARTNERS

GRADUATE STUDENTS

MEMBER SERVICES

# Case Study: Linux Kernel

- Red Hat Enterprise Linux 4 Kernel
  - Over 14,000 **source code** files (*.c, *.h, *.s)
  - Over 10,000 **files changed** in the 16 months prior to release
    - Examined **version control change logs**
  - ~200 files found to have a **post-release vulnerability**
    - 2% changed files **vulnerable**, 98% **neutral**
  - ~550 **developers**

Project supported by ARO

# Results: Linus' Law

- Files changed by **many developers** were less likely to have a vulnerability ✗

  *A file was **16 times more likely** to have a vulnerability if it had **9 or more developers** who changed it*
  *(33% vs. 2%)*

- Files changed by **multiple, otherwise-separated clusters of developers** are more likely to be vulnerable than changed by a single cluster ✓

# Results: Unfocused Contribution

- Files changed **many times** were more likely to have a vulnerability ✓

  *Vulnerable files had more commits (p<0.0125) than neutral files.*

- Files with **unfocused contributions** are more likely to have security vulnerabilities ✓

  *Contribution Network centrality was higher (p<0.0125) for files with vulnerabilities*

# Healthcare IT - 1

- Design Flaws:
  - Admin is super power
  - No logging
  - New users given customizable roles
  - Users can “shop around” without a trace
  - … analysis abandoned because we felt it could not be used in the US

Project supported by AHRQ

# Healthcare IT - 2

- Fortify static analysis alerts
  - 440 confirmed true positives (may overlap with below)
  - Cross site scripting, nonexistent access control, dangerous function, path manipulation, error information leak, more…
- Rational AppScan Automated Penetration Testing
  - 130 confirmed true positives (may overlap with above)
  - Cross site scripting, phishing, cross-site forgery, error information leak, SQL injection, more…
- Now working to attack manual black box
- Escapes from CCHIT Security Certification

# Selected Other NCSU Projects

- Is complexity a friend or enemy of security?
- Are specialized vulnerability prediction model desirable (or are fault prediction models sufficient)?
- What is the relationship between disclosed and exploited vulnerabilities?